

## Attachment of Hydrofoils to Otter Boards for Taking Surface Samples of Juvenile Fish and Shrimp<sup>1</sup>

**ABSTRACT:** Regular otter trawl boards were converted to surface trawl boards by attaching hydrofoils to the top edge of the boards. The conversion is simple and inexpensive. The converted otter boards were used to change a bottom trawl into a surface trawl that can be fished from one boat in the same manner as bottom gear. This trawl was efficient in sampling juvenile alewife (*Alosa pseudoharengus*), blueback herring (*A. aestivalis*), and brown shrimp (*Penaeus aztecus*).

### Introduction

Few types of towed fishing gear will capture effectively the juvenile fish and shrimp that inhabit surface waters. Types now in use for surface sampling include plankton nets and otter, beam, midwater, and surface trawls. These nets, as presently used, are inadequate or inefficient for accurately estimating the abundance of animals in surface waters.

In general, plankton nets are too small to capture juvenile fish and shrimp effectively. A large plankton net mounted on a sled was used by Chadwick (1964) to sample young striped bass at various water depths. For subsurface samples, the sled was towed at a depth of 5 feet by a short length of towing cable. He stated that striped bass longer than 2.0 inches (fork length) apparently were sampled inefficiently by the gear (larger fish avoided the net).

Otter and beam trawls are sometimes used to capture fish and shrimp at the water surface by towing the net close to the boat so that the float line cannot descend below the surface. Two major disadvantages are apparent with this sampling technique if the resulting data are to be used quantitatively. When the net is so close to the boat, it is difficult to strain constant volumes of water because of currents created by the propeller and by the moving boat. Secondly, one cannot assume that the boat does not frighten some of the animals away from the path of the trawl.

The beam trawl can be converted into one that samples surface waters by attaching hydrofoils or flotation devices to the frame. The beam trawl, as compared with the otter or midwater trawl, however, is cumbersome and creates more surface turbulence while it is towed. Massmann, Ladd, and McCutcheon (1952) converted an otter trawl into a surface trawl, but had to use two boats to pull the net. The net was, nevertheless, efficient in sampling clupeoid fishes in Virginia. Lavenberg and Fitch (1966) used a midwater trawl towed at high speed to take surface samples in the Gulf of California but they did not mention its efficiency in relation to tows made at other depths.

### Description of Gear

A 10-foot and an 18-foot otter trawl, similar to those described by Bullis (1951), were modified by attaching hydrofoils to the top edge of the otter boards. These hydrofoils kept the trawl boards at, or just under, the water surface as they were being towed (Fig. 1). Dimensions of the otter board and hydrofoil for the 10-foot trawl are shown in Figure 2. A brass runner was attached to the front and bottom edges of the otter board for connection of the hydrofoil, and for balance.

The hydrofoil is adjustable so that various angles between the upper edge of the otter board and lower surface of the hydrofoil can be formed. A 30° angle, used on the board described, caused the anterior end of the hydrofoil to run just below the water surface when the trawl was towed at various distances behind the boat. Lengths and the spacing of the points of attachment of the bridle chains to the board were based on ratios given by Bullis (1951). Each otter board, including hydrofoil and bridle chains, weighed about 14 pounds.

### Sampling Advantages of the Surface Trawl

Otter trawls converted into surface trawls were effective in capturing juvenile alewife (*Alosa pseudoharengus*) and blueback herring (*A. aestivalis*) in Albemarle Sound, North Carolina, and juvenile brown shrimp (*Penaeus aztecus*) in Boli-

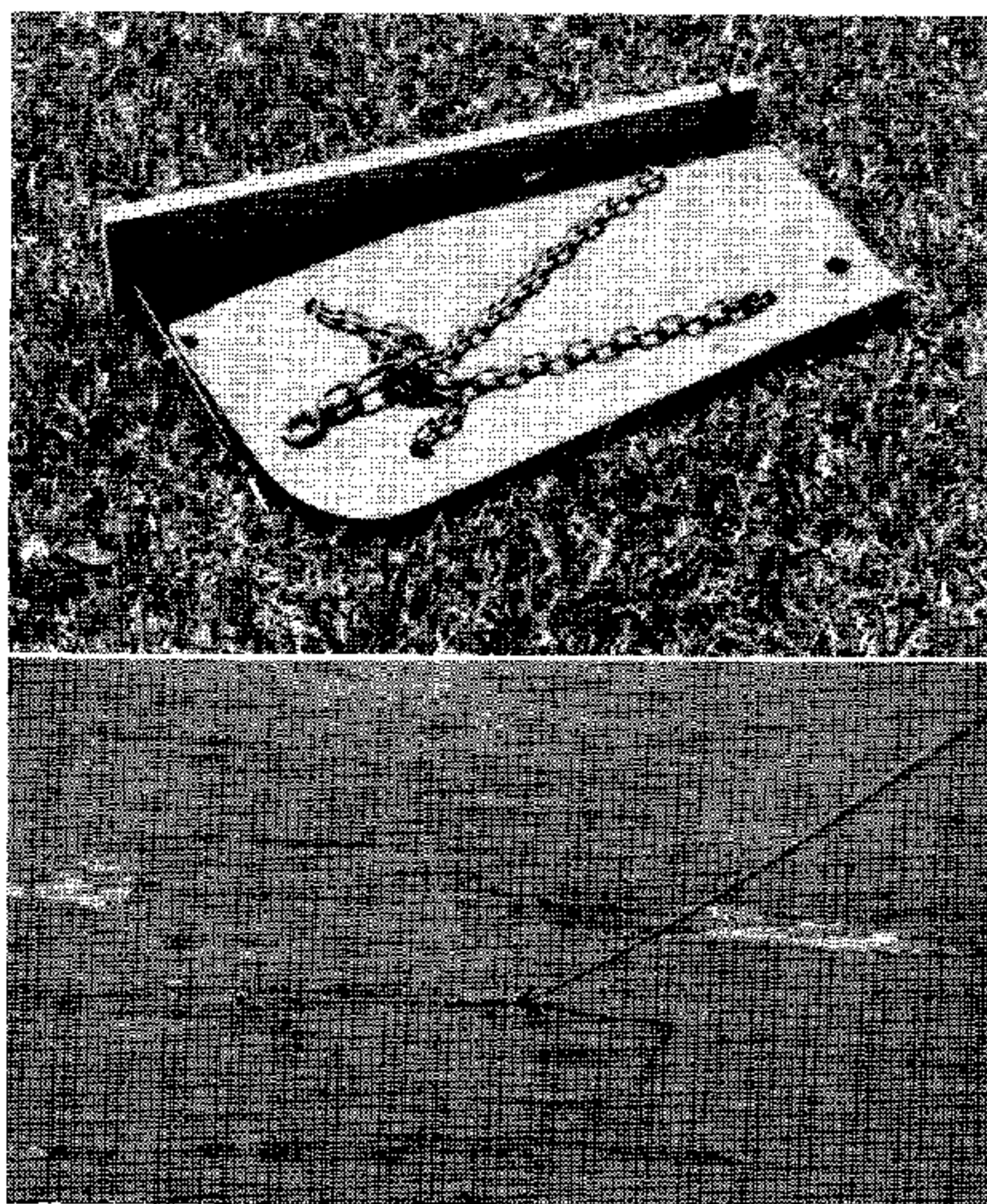


FIG. 1. Otter board converted for surface trawling and the trawl being towed.

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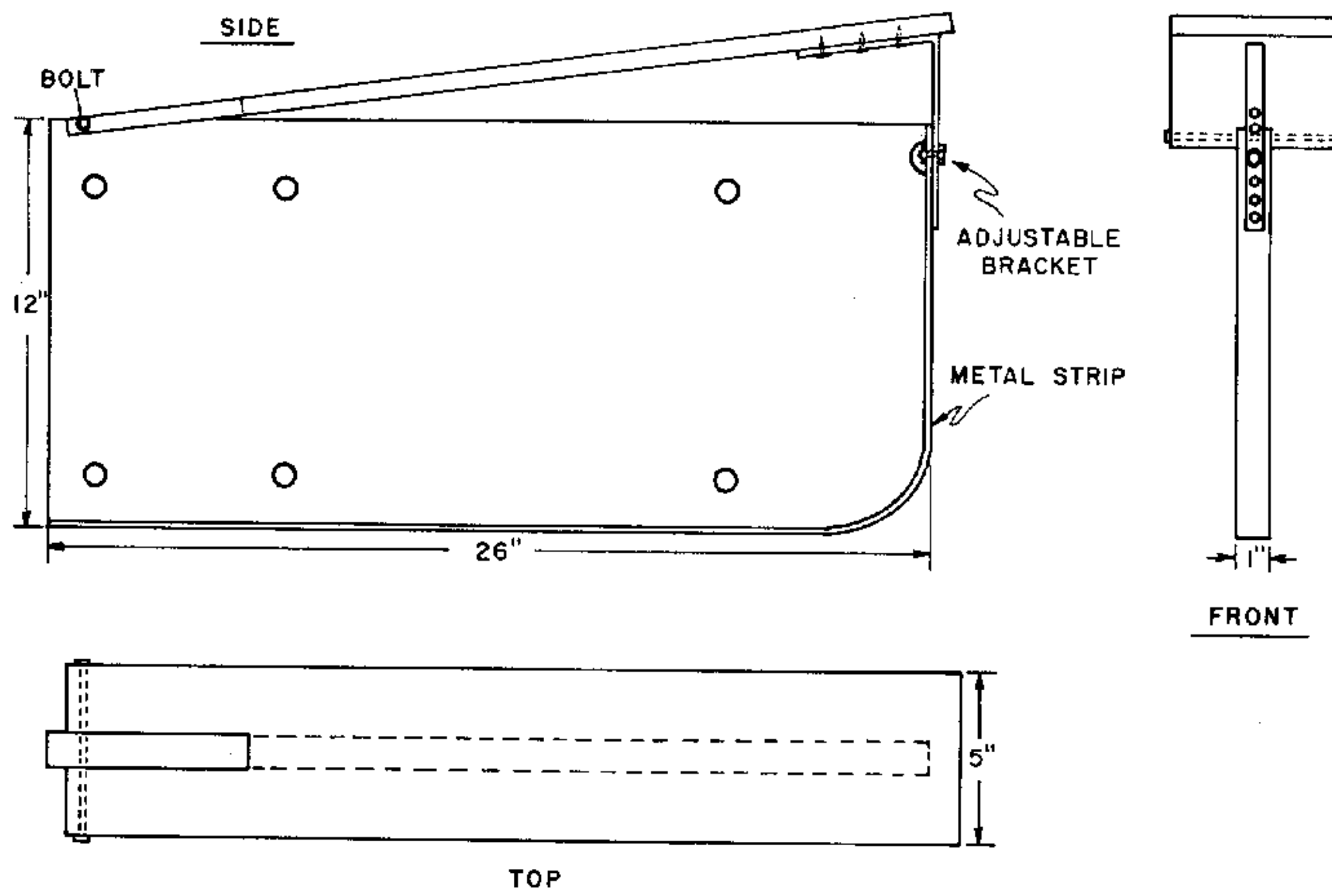


Fig. 2. Method of attachment of hydrofoil to otter board.

var Roads, Texas (tidal pass between Galveston Bay and the Gulf of Mexico). Catch per unit of effort by the surface trawl was often 20 times as great for herring and 5 times for shrimp as alternate bottom tows with the same size of trawl.

Catches with the surface trawl in Bolivar Roads often contained shrimp only. These shrimp were in better condition than those taken with the bottom gear. Thus, the surface trawl, on occasion, can be used efficiently in obtaining shrimp for marking studies.

The surface trawl has many advantages over other types of fishing gear for taking surface samples of fish and shrimp. It can be made easily as bottom trawls presently available at most estuarine research stations can be converted quickly and inexpensively. Thus, the surface trawl can be used to estimate relative abundance of surface-dwelling animals which bottom trawls rarely capture.

Within limits any size of trawl can be used. This conversion reduces greatly the problem of escape-ment of larger animals from plankton nets that are used for surface sampling. The surface trawl can be

fished as easily as a bottom trawl. A regular, or converted, otter trawl is less expensive and easier to handle than a similar size of beam trawl.

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